

WE CLAIM:

1. In an electrochemical device comprising an electrolyte having an anode side and a cathode side, at least one consumable carbonaceous material disposed on said anode side, and crossover means for reducing crossover of said at least one consumable carbonaceous material through said electrolyte to said cathode side, the improvement comprising:

said crossover means comprising a chemical barrier disposed on said anode side of said electrolyte.

2. An electrochemical device in accordance with Claim 1, wherein said chemical barrier comprises at least one substantially non-consumable chemical additive disposed in said at least one consumable carbonaceous material.

3. An electrochemical device in accordance with Claim 1, wherein said electrolyte is a solid comprising a plurality of crossover sites suitable for crossover of said at least one consumable carbonaceous material through said electrolyte.

4. An electrochemical device in accordance with Claim 3, wherein said chemical barrier comprises at least one chemical additive suitable for attachment to at least a portion of said plurality of crossover sites.

5. An electrochemical device in accordance with Claim 1, wherein said chemical barrier comprises a chemical additive comprising at least one organic molecule that is larger than a molecule of said at least one consumable carbonaceous material.

6. An electrochemical device in accordance with Claim 4, wherein said at least one consumable carbonaceous material is methanol.

7. An electrochemical device in accordance with Claim 6, wherein said at least one chemical additive comprises at least one organic compound having a molecular size that is larger than a molecular size of said methanol.

8. An electrochemical device in accordance with Claim 7, wherein said at least one chemical additive comprises an organic compound selected from the group consisting of alcohols, glycols and mixtures thereof.

9. An electrochemical device in accordance with Claim 8, wherein said at least one chemical additive comprises iso-propanol.

10. An electrochemical device in accordance with Claim 8, wherein said at least one chemical additive comprises butanol.

11. An electrochemical device in accordance with Claim 8, wherein said at least one chemical additive comprises ethylene glycol.

12. An electrochemical device in accordance with Claim 6, wherein said electrochemical device is a direct methanol fuel cell.

13. An electrochemical device in accordance with Claim 12, wherein said electrolyte is a polymer electrolyte membrane.

14. An electrochemical device in accordance with Claim 13, wherein said electrolyte is fluorosulfonic acid.

15. In an electrochemical device comprising an electrolyte having an anode side and a cathode side, and at least one consumable carbonaceous material in solution disposed on said anode side, a method for reducing crossover of said at least one consumable carbonaceous material through said electrolyte to said cathode side comprising the steps of:

introducing at least one chemical additive into said solution whereby a chemical barrier is formed proximate to said electrolyte, said chemical barrier preventing crossover of at least a portion of said at least one consumable carbonaceous material through said electrolyte.

16. A method in accordance with Claim 15, wherein an amount of said chemical additive remains substantially constant during operation of said electrochemical device.

17. A method in accordance with Claim 15, wherein said electrochemical device is a direct methanol fuel cell and said at least one consumable carbonaceous material is methanol.

18. A method in accordance with Claim 17, wherein said at least one chemical additive comprises at least one organic compound having a molecular size that is larger than a molecular size of said methanol.

19. A method in accordance with Claim 18, wherein said at least one chemical additive comprises an organic compound selected from the group consisting of alcohols, glycols and mixtures thereof.

20. A method in accordance with Claim 19, wherein said at least one chemical additive comprises iso-propanol.

21. A method in accordance with Claim 19, wherein said at least one chemical additive comprises butanol.

22. A method in accordance with Claim 19, wherein said at least one chemical additive comprises ethylene glycol.